Computational Analysis of Wind Energy Input into Overhead Power Lines: Turbulence

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Abstract

Alternate shedding of vortices from the top and bottom of a conductor in a flow of wind causes Aeolian vibrations in overhead lines. Energy transfer to the conductors are calculated using the energy balance method. Simulation of wind power input into a harmonically oscillating cylinder by a turbulent flow is solved by numerical integration of the Navier-Stokes equations using a numerical simulation tool. The results show that the assumption of lock-in phenomenon has oscillatory behaviour at lower amplitude to diameter (A/d) ratios for forced cylinder motion. Numerical results are in good agreement in the laminar case and k- ω SST turbulent case with measurements. The relationship between cylinder motion and vortex shedding is unsteady resulting in lower power transfer to the cylinder. The vortex shedding frequency oscillates with 10% turbulent intensity and length scales of 25 mm, 50 mm and 75 mm.

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